

Terminal Doppler Weather Radar
Market Survey Data Sheet for Slip Ring Assemblies
16 May 2012

1.0 Mission.

- 1.1 Intent. The intent of this document is to define what the TDWR antenna pedestal system capabilities currently are and what the minimum requirements are of a replacement antenna pedestal slip ring assembly. This document is also intended to provide enough information for a prospective company/vendor to decide whether or not they may be capable of providing a replacement antenna pedestal slip ring assembly that meets the TDWR system's requirements.
- 1.2 Expectations. The replacement pedestal slip ring assembly will be expected to meet or exceed the specifications and capabilities of the present brush-style pedestal slip ring assembly. The replacement pedestal slip ring assembly will support a brushless motor/resolver feedback, dual-motor drive system and will be expected to minimize maintenance (dustless) and to increase the reliability of the TDWR antenna pedestal. The replacement slip ring assembly shall be designed to meet or exceed the requirements as outlined in FAA-G-2100H, Federal Aviation Administration Specification, Electronic Equipment, General Requirements, dated May 9, 2005.
- 1.3 Facilities. The numbers of TDWR facilities that are requiring this antenna pedestal slip ring assembly retrofit are 47. Spare parts will be required to be located at the central depot located in Oklahoma City.
- 1.4 Mission of TDWR
 - 1.4.1 Primary Mission of TDWR. The primary mission of the TDWR is to enhance the safety of air travel through the timely detection and reporting of hazardous wind shear in and near the terminal approach and departure zones of an airport. Specific sources of the hazardous wind shear that are to be detected are microbursts and gust fronts.
 - 1.4.2 Secondary Mission. The secondary mission of the TDWR is to improve the management of air traffic in the terminal area through the forecast of gust front induced wind shifts at the airport, detection of precipitation and reporting of storm motion.
 - 1.4.3 Operational Environment. The TDWR is deployed at an unmanned location, visited only for preventive and corrective maintenance. As such, the TDWR is expected to meet full functional requirements in all operational modes as an unattended system. TDWR operates 24 hours a day, 7 days a week, except when shut down for corrective or preventive maintenance.

Terminal Doppler Weather Radar
Market Survey Data Sheet for Slip Ring Assemblies
16 May 2012

2.0 Slip Ring Environment

The Slip ring assembly is mounted inside of an antenna pedestal that is rain tight, and the entire pedestal is protected by a radome but otherwise is not environmentally protected.

2.1 Operating life

The slip ring assembly will be operated continuously and will have a life period of 20 years. It is expected that there will be a minimum of 53×10^6 revolutions of the slip ring assembly over the period of 20 years.

2.2 Temperature

The operating temperature range of the slip ring assembly will be:

-50° C to +55° C

The non-operating (storage) temperature of the slip ring assembly will be:

-40° C to +70° C

2.3 Altitude

0 to 10,000 feet above MSL (operating)

0 to 50,000 feet above MSL (non operating)

2.4 Humidity

5% to 100% operating (above 40°, the relative humidity shall be based on a dew point of 40° C).

Up to 100% non operating, including condensation due to temperature changes.

2.5 Salt Fog

The slip ring shall be resistant to the corrosive effects of a salt fog atmosphere.

2.6 Fungus

No fungus nutrients shall be used in the construction of this unit. Only inherently fungus-resistant materials shall be used. Reference Guideline 4 of MIL-HDBK-454B for guidance.

3.0 Reliability Requirements

3.1 Safety

The unit shall conform to Government/DOD safety requirements. Reference Guideline 1 of MIL-HDBK-454B for guidance.

3.2 Dissimilar Metals

If dissimilar metals must be in contact, precautions must be taken to alleviate electrolytic corrosion. Design shall be in accordance with MIL-STD-889B. Reference Guideline 16 of MIL-HDBK-454B for guidance.

3.3 Workmanship

Workmanship shall conform to best acceptable practices. Reference Guideline 9 of MIL-HDBK-454B for guidance.

3.4 Quality Assurance Provisions

Shall be in accordance with the purchase order.

The vendor shall test each slip ring assembly prior to shipment. Testing shall be in accordance with the vendor generated and FAA approved test procedures. A copy of the test results shall be shipped with each assembly.

The FAA may perform tests on any production shipment to substantiate that the design criteria have been satisfied.

- 3.5** All of the specifications herein, including the electrical noise requirement of paragraph 5.5, shall be met over the unit's 20-year service life.

4.0 Mechanical

- 4.1 Housing:** The housing shall be a cylindrical shape with an internal hollow shaft. The internal hollow shaft shall have a diameter large enough to pass through the flange of a WR-187 waveguide.

- 4.2 Dielectric:** Material shall be in conformance with this specification.

- 4.3 Contacts:** The contacts of the assembly are to be dustless.

- 4.3 Internal Wire:** All conductors are to be stranded. Wire shall be insulated and meet environmental requirements herein. Wire temperature rating shall be 105° C minimum.

Terminal Doppler Weather Radar
Market Survey Data Sheet for Slip Ring Assemblies
16 May 2012

- 4.4 Connectors:** Connectors shall be per MIL-C-38999, type MS27466.
- 4.5 Mechanical:** Construction and physical dimensions shall be in accordance with this specification.
- 4.6 Rotational Speed:**
Velocity: 30 degrees per second (5 RPM).
Acceleration: 15 degrees/sec/sec
- 4.7 Rotational Torque:** 10 ft-lbs. maximum

5.0 Electrical

A total of 73 circuits are required for this application. The circuits shall have the characteristics according to this specification:

- 5.1 Insulation Resistance: Circuits 1 through 21:** 500 MEGOHMS minimum @ 1500 VDC when tested between mutually insulated points or between insulated points and ground.
- 5.1.1 Insulation Resistance: Circuits 22 through 73:** 200 MEGOHMS minimum @ 500 VDC when tested between mutually insulated points or between insulated points and ground.
- 5.2 Dielectric Strength: Circuits 1 through 21:** 1500 VRMS @ 60 Hz for 5 seconds when tested between mutually insulated points or between insulated points and ground.
- 5.2.1 Dielectric Strength: Circuits 22 through 73:** 500 VRMS @ 60 Hz for 5 seconds when tested between mutually insulated points or between insulated points and ground.
- 5.3 Circuits 1 through 21:**
- 5.3.1 Quantity of 2:** 4-wire twisted shielded insulated 12 AWG circuits, 50 Amps RMS, 320VDC each; 5 rings including 1 shield (see note 2) per circuit. Total number of rings used is 10.
- 5.3.2 Quantity of 2:** 2-wire twisted shielded insulated 16 AWG circuits, 40 Amps RMS, 200VAC each. Single phase divided amongst 4 wires (2 hot, 2 neutral) combined into 2 rings. Total number of rings used is 4, including 2 shields (see note 2).
- 5.3.3 Quantity of 1:** 2-wire twisted shielded insulated 16 AWG circuits, 5 Amps RMS, 200VAC. Single phase with neutral and shield (see note 2). Total number of rings used is 3.
- 5.3.4 Quantity of 2:** 2-wire insulated 16 AWG circuits, 35 Amps RMS, 200VAC each; 1 ring per circuit. One line divided amongst 2 wires combined into one ring. Total number of rings used is 2.

Terminal Doppler Weather Radar
Market Survey Data Sheet for Slip Ring Assemblies
16 May 2012

- 5.3.5** Quantity of 1: 2-wire insulated 16 AWG circuit, 40 Amps RMS 200VAC; 1 ring per circuit. One line divided amongst 2 wires combined into one ring. Total number of rings used is 1.
- 5.3.6** Quantity of 1: 1-wire insulated 16 AWG circuit, 35 Amps RMS, 200VAC; 1 ring per circuit. Total number of rings used is 1.

Note 1: For thermal design considerations, any 10 of these power circuits (**circuits 1 through 21**) will be at their full rated power (current) at any given instant; the others will be at half current or less.)

Note 2: Shield is to be continuous through the assembly. Shield ring is to be rated for no less than ½ Amp and 24 AWG.

5.4 Circuits 22 through 73

- 5.4.1** Quantity of 2: Twisted shielded insulated triple, 22 AWG circuits, 2 Amps, 200VAC; 4 rings per circuit including 1 shield. Total number of rings used is 8.
- 5.4.2** Quantity of 8: Twisted shielded insulated pair, 20 AWG circuits, 2 Amps, 200VAC; 3 rings per circuit including 1 shield. Total number of rings is 24.
- 5.4.3** Quantity of 20: 1-wire insulated 20 AWG circuits, 2 Amps RMS, 200VAC; 1 ring per circuit. Total number of rings is 20.

- 5.5 Electrical Noise:** Dynamic contact resistance change of any of the 73 circuits shall not exceed 30 milliohms at 50 milliamps at 5 RPM.

6.0 Overall Physical Dimensions:

- 6.1 Inner Cylinder Diameter:** 4.00 inches, minimum
- 6.2 Outer Cylinder Diameter (not including connectors):** 8.25 inches maximum
- 6.3 Overall Length (not including connectors or pin):** 21.5 inches +0/-0.2.

7.0 Maintenance:

- 7.1 Periodic Maintenance.** The antenna pedestal slip ring assembly will be maintained in accordance with manufacturers' recommendations. It is expected that the periodic maintenance will consist of listening for worn or deteriorating bearings and visual inspection of rings and contacts for cleanliness (if required) at intervals not to be less than annually. Based upon the bearing life and ring contact life determined by the manufacturer, slip rings will be periodically replaced at scheduled intervals not less than once every 7 years to prevent unscheduled outages of the TDWR system.
- 7.2** Should there be a requirement for periodic cleaning of the rings, there should be no chance for exposure to hazardous materials. There should be no requirement for maintenance technicians to don respirators. The prescribed maintenance should be able to be completed within 45 minutes. There will be no other periodic maintenance.

Terminal Doppler Weather Radar
Market Survey Data Sheet for Slip Ring Assemblies
16 May 2012